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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: A. Ishida et al. : Art Unit: 1745
Serial No.: 09/042,681 : Examiner: J. Crepeau
Filed: March 12, 1998 : **RESPONSE UNDER**
FOR: LITHIUM SECONDARY BATTERY : **37 C.F.R. 1.116**
: **EXPEDITED PROCEDURE**

APPELLANTS' BRIEF UNDER 37 C.F.R. § 1.192

Box AF
Hon. Asst. Commissioner for Patents
Washington, DC 20231

This brief is in furtherance of the Notice of Appeal, filed September 10, 2001.

(1) REAL PARTY IN INTEREST

The real party in interest is Matsushita Electric Industrial Co., Ltd., Kadoma, Osaka, Japan.

(2) RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

(3) STATUS OF CLAIMS

Claims 16-30 are pending in the application. Claims 16-25 are appealed.

Claims 16-21 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Angell, U.S. Patent 5,849,432 ("Angell"), in view of the English language abstract of JP 7-153495 ("JP 7-153495" or "the Japanese reference").

Claims 22-24 stand rejected under 35 U.S.C. 103(a) as being unpatentable over JP 7-153495.

Claim 25 stands rejected under 35 U.S.C. 103(a) as being unpatentable over JP 7-15349 as applied to claims 22-24 and further in view of Tsukamoto, U.S. Patent 5,677,08 ("Tsukamoto").

(4) STATUS OF AMENDMENTS

An amendment was filed with this response to put the claims in better condition for appeal. It is assumed that this amendment has been entered.

(5) SUMMARY OF THE INVENTION

The invention is a lithium secondary battery that comprises a positive electrode, a negative electrode, and an electrolyte. The negative electrode comprises ceramic particles that do not relate to the charge and discharge reaction of the battery. The battery has a high capacity and excellent current characteristics.

The claims of Groups I and II recite a lithium battery in which the negative electrode comprises the ceramic particles of the battery and a gel polymer electrolyte that does not comprise the ceramic particles. The gel polymer electrolyte should not be confused with a polymer electrolyte, which may be present in the electrodes.

The claims of Group III recite a lithium battery in which the negative electrode comprises the ceramic particles. The battery additionally comprises a microporous polymer film separator between the positive electrode and the negative electrode.

(6) ISSUES

1. Do persons of ordinary skill in the art consider the negative electrode and the positive electrode of a secondary battery to be equivalent or interchangeable?

2. Is an invention that claims a secondary battery that comprises a ceramic-particle-containing negative electrode obvious over a reference that discloses a secondary battery that comprises a ceramic-particle-containing positive electrode when there is no evidence that persons of ordinary skill in the art consider the negative electrode and the positive electrode of a secondary battery to be equivalent or interchangeable?

(7) GROUPING OF CLAIMS

The claims do not all stand or fall together. The claims are divided into three groups as follows:

Group I - Claims 16-20

Group II - Claim 21

Group III - Claims 22-25

(8) ARGUMENT

For the reasons given below, these rejections are respectfully traversed and reversal of the Examiner's action is respectfully requested.

A. The Claims of Group I

Claims 16-21, the claims of Group I recite a lithium battery in which the negative electrode comprises the ceramic particles of the battery and a gel polymer electrolyte that does not comprise the ceramic particles.

Claims 16-21 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Angell in view of the English language abstract of JP 7-153495).

Angell discloses electrolyte solvents for use in liquid or rubbery electrolyte solutions. Abstract. The Office admits that Angell does not "explicitly teach that the composite cathode contains a ceramic (i.e., alumina) not relating to charge and discharge of the battery or that the cathode is a "negative electrode." Paper 17, page 6, lines 5-7.

JP 7-153495 teaches addition of one or more oxides to a lithium-containing composite oxide, and generating the positive electrode of a lithium secondary battery. Abstract, first sentence. The Examiner admits that JP 7-153495 "does not explicitly teach that the negative electrode contains the ceramic." Paper 17, page 8, line 11.

The Examiner's position is stated as follows:

> Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of the Japanese reference to incorporate alumina particles into the composite cathode of Angell et al. In the abstract, the Japanese reference teaches that capacity deterioration of the battery can be prevented by adding ceramic particles to the positive electrode which comprises a lithium transition metal oxide. Accordingly, the artisan would have sufficient motivation to incorporate alumina particles

into the composite cathode of Angell et al.

> Regarding the limitation the "negative electrode" contains ceramic particles, the artisan would understand that the cathode of Angell et al. could in fact function as a negative electrode, depending on the mode of operation of the battery. During discharge of the battery, the cathode ($LiCoO_2$) would function as a positive electrode, however, during charging of the battery it would function as a negative electrode. The anode (carbon material) of Angell et al. would have the opposite functions during charge and discharge. Accordingly, the recitation of the negative electrode containing the ceramic particles is not considered to distinguish over the reference.

Paper 17, page 6, line 11, to page 7, line 4 (emphasis added).

The Examiner has not made the *prima facie* case. Appellants' claims recite a lithium battery in which the negative electrode comprises the ceramic particles. The Japanese reference teaches addition of a composite oxide to the positive electrode of a lithium ion secondary battery, a deficiency that is not overcome by Angell. Combination of the references in the manner indicated by the Examiner does not produce appellants' invention. The rejection of the claim 16-21 as being unpatentable over Angell in view the Japanese reference should be reversed. *In re Ochiai*, 37 USPQ2d 1127, 1131 (Fed. Cir. 1995) ("[w]hen the references cited by the examiner fail to establish a prima facie case of obviousness, the rejection is improper and will be overturned").

To overcome this admitted deficiency in his alleged *prima facie* case, the Examiner has asserted, without support, that persons of ordinary skill in the art would consider the positive electrode and the negative electrode of a lithium secondary battery to be equivalent. There is no evidence of record to indicate this

is the case or that persons of ordinary skill in the art reverse the positive and negative designations when the battery is being charged.

The U.S. patents of record in this application, written for persons skilled in the art (35 U.S.C. 112 ¶ 1 (specification must enable a person of ordinary skill in art to make and use the invention)), indicate otherwise. They describe the positive electrode and negative electrode as separate structures. For example, Kawakami, describes a positive electrode and a negative electrode, which have different structures and functions. Kawakami, column 1, lines 34-44. Chang U.S. Patent 5,545,496 ("Chang") describes a positive electrode and a negative electrode as separate structures. Chang, column 1, lines 23-30. Tsukamoto, describes a secondary battery in which a carbonaceous material is used as the negative electrode active material. Tsukamoto, Abstract. Preparation of a positive electrode containing $LiCoO_2$ is described. Tsukamoto, column 8, lines 10-24.

Further, the positive and negative electrodes have different chemical structures. The structure of a lithium secondary battery is generally described in appellants specification, page 1, line 5, to page 4, line 101, in Chang, column 1, line 17, to column 2, line 36, and Kawakami column 1, lines 34-57. Briefly, the negative electrode can be metallic lithium, but dentric lithium is formed during charging and discharging of the battery. Specification, page 1, lines 5-15. Consequently, these batteries have been replaced by batteries in which a transition metal compound containing lithium is the positive electrode and carbon that that can occlude and release lithium ions is the negative electrode. Specification, page 2, lines 23-30; Tsukamoto, column 1, lines 33-43. The positive electrode may comprise a transition metal chalcogenide or intercalation compound, electronically conductive particles, an ionically conductive polymer matrix (polymer electrolyte), and a current collector. Chang, column 1, lines 61-65. *See also*, Specification, page 9, lines 222, to page 9, line 252, and page 29, lines 747-750, Kawakami,

column 11, lines 34-40, and Tsukamoto, column 6, lines 51-65. Nothing of record indicates that persons of ordinary skill in the art consider these chemically different structures to be equivalent.

There is no evidence that persons of ordinary skill in the art consider the positive electrode and negative electrode to be equivalent. The Examiner has supported his position with argument. Argument is not evidence.

The Examiner bears the burden of making the *prima facie* case. *Ochiai* , 37 USPQ2d at 1131. Although appellants' are not obligated to produce evidence to rebut the Examiner's assertion until the Examiner has produced evidence to support it, appellants point to the fact that the art describes the positive electrode and the negative electrode separately, the fact that they have different chemical structures, and the absence of any statement of equivalence in the art of record indicate that persons of ordinary skill in the art do not consider the positive electrode and negative electrode to be equivalent. Thus, the Examiner's assertion is a factually unsupported opinion of an examiner, which is entitled to little weight. *In re Wagner*, 152 U.S.P.Q. 552, 559 (CCPA 1967) (factually unsupported opinions of examiners are of little weight against contrary evidence).

The Examiner's unsupported assertion of equivalence does not overcome the deficiency in his alleged *prima facie* case. Thus, the claims are patentable over the art of record. The rejection of the claims 16-20 as being unpatentable over Angell in view the Japanese reference should be reversed

B. The Claim of Group II

Claim 21, the claim of Group II, depends of claim 20, a claim of Group I, and should be allowable as a dependent claim dependent on an allowable claim.

In addition, claim 21 recites an additional limitation, "the positive electrode comprises $LiCoO_2$ or V_6O_{13}." This claim recites specific /materials that are

present in the positive electrode. This additional limitation additionally distinguishes the positive electrode from the negative electrode. $LiCoO_2$ and V_6O_{13}. are described in the art as components of the positive electrode. *See*, for example, Tsukamoto, column 6, lines 51-65 (oxides of cobalt or vanadium), and column 8, lines 10-24 ($LiCoO_2$); Angell, column 14, lines 35-36, ($LiCoO_2$), Kawakami, column 11, lines 53-64 (oxides of cobalt); and Chang, column 1, line 61, to column 2, line 3 (V_6O_{13}). Nothing of record indicates that persons of ordinary skill consider positive electrodes that comprise these materials to be equivalent with negative electrodes.

For this additional reason, claim 21, the claim of Group II, is patentable over the art of record. The rejection of the claim 21 as being unpatentable over Angell in view the Japanese reference should be reversed.

C. The Claims of Group III

The claims of Group III, claims 22-25, recite a lithium battery in which the negative electrode comprises the ceramic particles. The battery additionally comprises a microporous polymer film separator between the positive electrode and the negative electrode.

Claims 22-24 stand rejected under 35 U.S.C. 103(a) as being unpatentable over JP 7-153495. Claim 25 stands rejected under 35 U.S.C. 103(a) as being unpatentable over JP 7-15349 as applied to claims 22-24 and further in view of Tsukamoto.

As discussed above, JP 7-153495 teaches addition of one or more oxides to a lithium-containing composite oxide, and generating the positive electrode of a lithium secondary battery. Abstract, first sentence. The Examiner admits that JP 7-153495 "does not explicitly teach that the negative electrode contains the ceramic." Paper 17, page 8, line 11.

Tsukamoto discloses an electrode suitable for a chargeable/dischargeable battery. Tsukamoto, Abstract. $LiCoO_2$ is disclosed as a positive electrode material. Tsukamoto, column 6, lines 59-64.

The Examiner's position is as follows:

> However, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would understand that the positive electrode of the reference could in fact function as a negative electrode, depending on the mode of operation of the battery. As set forth in paragraph 4 above, during discharge of the battery, the cathode ($LiCoO_2$) would function as a positive electrode, however, during charging of the battery it would function as a negative electrode. The anode (carbon material) of references would have the opposite functions during charge and discharge. Accordingly, the recitation of the negative electrode containing the ceramic particles is not considered to distinguish over the reference.

Page 8, line 15, to page 9, line 2 (emphasis added).

The Examiner has not made the *prima facie* case. Appellants' claims recite a lithium battery in which the negative electrode comprises the ceramic particles. The Japanese reference teaches addition of a composite oxide to the positive electrode of a lithium ion secondary battery. The rejection of the claims 22-24 as being unpatentable over the Japanese reference should be withdrawn.

To overcome this admitted deficiency in his alleged *prima facie* case, the Examiner again asserts, without support, that persons of ordinary skill in the art would consider the positive electrode and the negative electrode of a lithium secondary battery to be equivalent.

As discussed above, there is no evidence of record to indicate this is the case or that persons of ordinary skill in the art reverse the positive and negative designations when the battery is being charged. To the contrary, the fact that the art describes the positive electrode and the negative electrode separately, the fact that they have different chemical structures, and the absence of any statement of equivalence in the art of record, indicates that persons of ordinary skill in the art do not consider the positive electrode and negative electrode to be equivalent. Thus, the Examiner's assertion is a factually unsupported opinion of an examiner, which is entitled to little weight. W*agner*, 152 U.S.P.Q. at 559.

Further, the claims recite that the positive electrode comprises a lithium transition metal compound oxide and that the negative electrode comprises an active substance that occludes and releases lithium ions. As discussed above, the art describes these as features of the positive electrode and negative electrode, respectively. These limitations additionally distinguish the positive electrode from the negative electrode.

As discussed above, the Examiner's unsupported assertion of equivalence does not overcome the deficiency in his alleged *prima facie* case. Thus, the claims are patentable over the art of record. The rejection of the claims 22-24 as being unpatentable over the Japanese reference should be reversed.

Claim 25, which also is in Group III, stands rejected under 35 U.S.C. 103(a) as being unpatentable over JP 7-15349 as applied to claims 22-24 and further in view of Tsukamoto. As discussed above, claims 22-24 are allowable. Therefore, claim 25 is allowable over the art of record as a claim dependent of an allowable claim.

D. Conclusion

The Examiner has not made the *prima facie* case. Combination of the references in the manner indicated do not produce appellants' invention. The Examiner's alleged *prima facie* case depends on an unsupported assertion of equivalency between the positive and negative electrodes.

For these reasons given above, the rejection of claims 16-25 should be reversed and such action is earnestly solicited.

Respectfully submitted,

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(9) APPENDIX

CLAIMS ON APPEAL

16. A lithium polymer secondary battery comprising:

a positive electrode;

a negative electrode;

a gel polymer electrolyte comprising polymer and an organic electrolyte solution dissolving a lithium salt; and

ceramic particles not relating to the charge and discharge reaction of the battery in the negative electrode;

wherein:

the content of the ceramic particles is 0.01 to 10 parts by weight in 100 parts by weight of active substance in the negative electrode;

the particle size of the ceramic particles is 10 microns or less; and

the gel polymer electrolyte does not comprise ceramic particles.

17. The lithium polymer secondary battery of claim 16 in which the ceramic particles comprises at least one ceramic material selected from the group consisting of Al_2O_3, SiO_2, ZrO_2, MgO, and Na_2O.

18. The lithium polymer secondary battery of claim 16 in which the ceramic material is Al_2O_3.

19. The lithium polymer secondary battery of claim 16 in which at least one of the positive electrode and the negative electrode comprises a polymer electrolyte.

20. The lithium polymer secondary battery of claim 19 in which the

ceramic material is Al_2O_3.

21. The lithium polymer secondary battery of claim 20 in which the positive electrode comprises $LiCoO_2$ or V_6O_{13}.

22. A non-aqueous lithium ion secondary battery comprising:

a positive electrode comprising a lithium transition metal compound oxide;

a negative electrode comprising an active substance that occludes and releases lithium ions;

a microporous polymer film separator between the positive electrode and the negative electrode; and

a nonaqueous electrolyte solution dissolving a lithium salt;

wherein:

the negative electrode comprises ceramic particles not relating to the charge and discharge reaction of the battery;

the content of the ceramic particles is 0.01 to 10 parts by weight in 100 parts by weight of the active substance in the negative electrode; and

the particle size of the ceramic particles is 10 microns or less.

23. The battery of claim 22 in which the ceramic particles comprises at least one ceramic material selected from the group consisting of Al_2O_3, SiO_2, ZrO_2, MgO, and Na_2O.

24. The battery of claim 23 in which the ceramic material is Al_2O_3.

25. The battery of claim 24 in which the lithium transition metal compound oxide is $LiCoO_2$.